



Serial No.: 09/758,067
Confirmation No.: 7121
Applicant: Holland, et al.
Atty. Ref.: 12350.0008.NPUS00

AMENDMENTS TO THE CLAIMS:

Please amend the claims as follows:

1. (cancelled)
2. (cancelled)
3. (cancelled)
4. (cancelled)
5. (cancelled)
6. (cancelled)
7. (cancelled)
8. (cancelled)
9. (cancelled)
10. (cancelled)
11. (cancelled)
12. (cancelled)
13. (cancelled)
14. (cancelled)
15. (cancelled)
16. (cancelled)
17. (cancelled)
18. (cancelled)
19. (cancelled)
20. (cancelled)
21. (cancelled)

22. (new) A method for finishing a metal article, comprising the steps of:

B 1

- a) placing the metal article in a vibratory finishing apparatus, in combination with:
 - i. a chemical solution capable of reacting with the surface of the metal article to form a blackmode on the surface of the metal article, and
 - ii. a non-abrasive plastic media; and

RECEIVED

MAR - 5 2003

TC 1700 MAIL ROOM

b) agitating the metal article, the non-abrasive plastic media, and chemical solution in the vibratory finishing apparatus so that the non-abrasive plastic media can remove the blackmode from the surface of the metal article, thereby refining the surface of the metal article, after which the blackmode is immediately re-formed by the reaction between the metal article and the chemical solution for further refining by the non-abrasive plastic media.

23. (new) The method of claim 22, wherein the vibratory finishing apparatus is operated at 800-1500 revolutions per minute at an amplitude of 1 to 8 millimeters.

24. (new) The method of claim 22, wherein the chemical solution is added to the vibratory finishing apparatus at a rate of 0.25-0.4 gallons per hour per cubic foot volume of the vibratory finishing apparatus.

25. (new) The method of claim 22, wherein the non-abrasive plastic media has a hardness of about 57 on the Barcol scale.

26. (new) The method of claim 22, wherein the non-abrasive plastic media comprises about 50% by weight alumina bonded with an unsaturated polyester resin.

27. (new) The method of claim 22, wherein the non-abrasive plastic media has a density of about 1.8 g/cm³.

28. (new) The method of claim 22, wherein the non-abrasive plastic media has a crystal size of less than 0.9 mm.

29. (new) The method of claim 22, wherein the chemical solution comprises a chemical selected from the group consisting of phosphoric acid, phosphates, sulfamic acid, oxalic acid, oxalates, sulfuric acid, sulfates, chromic acid, chromates, bicarbonate, fatty acids, fatty acid salts, and combinations thereof.

30. (new) The method of claim 29, wherein the chemical solution further comprises an activator or accelerator selected from the group consisting of zinc, magnesium, iron phosphates and combinations thereof.

31. (new) The method of claim 29, wherein the chemical solution further comprises an oxidizer, selected from the group consisting of inorganic oxidizer, organic oxidizer,

peroxides, meta-nitrobenzene, chlorate, chlorite, persulfates, nitrate, nitrite compounds, and combinations thereof.

32. (new) The method of claim 29, wherein the chemical is provided as a concentrate, and is diluted with water to prepare the chemical solution, wherein the chemical is diluted to between 5-80% by volume of the solution.

33. (new) The method of claim 22, wherein the metal article comprises steel.

34. (new) The method of claim 33, wherein the chemical solution comprises phosphates.

35. (new) The method of claim 34, wherein the chemical solution is FERROMIL® FML-575 IFP maintained at a concentration of about 12.5% by volume.

36. (new) The method of claim 34, wherein the chemical solution is introduced into the vibratory finishing apparatus at a rate of about 0.375 gallons per hour per cubic foot volume of the vibratory finishing apparatus.

37. (new) The method of claim 22, wherein the non-abrasive plastic media is cone shaped.

38. (new) The method of claim 22, wherein the chemical solution is selected from the group consisting of FERROMIL® FML 575 IFP, FERROMIL® VII AERO-700, and REM® COPPERMIL 7.

39. (new) The method of claim 22, wherein after the surface of the metal article has been refined, a burnishing solution is introduced into the vibratory finishing apparatus.

40. (new) The method of claim 22 wherein the metal article comprises brass.

41. (new) The method of claim 40, wherein the chemical solution is REM® COPPERMIL 7 maintained at a concentration at about 10% by volume.

42. (new) The method of claim 41, wherein the chemical solution is introduced into the vibratory finishing apparatus at a rate of about 0.4 gallons per hour per cubic foot volume of the vibratory finishing apparatus.

43. (new) The method of claim 22 wherein the non-abrasive plastic media is combined with a non-abrasive metal media that is not reactive with the chemical solution.

44. (new) The method of claim 22, wherein the rate of blackmode formation and removal is balanced so that the blackmode is soft enough to allow the non-abrasive plastic media to remove the blackmode from the surface of the metal article and finish the metal article to an Ra of less than or equal to 2.5 microinches.

45. (new) A method for finishing a metal article, comprising the steps of:

- a) placing the metal article in a vibratory finishing apparatus, in combination with:
 - i. a chemical solution capable of reacting with the surface of the metal article to form a blackmode on the surface of the metal article, and
 - ii. a non-abrasive metal media that is not reactive with the chemical solution; and
- b) agitating the metal article, the non-abrasive metal media, and chemical solution in the vibratory finishing apparatus so that the non-abrasive metal media can remove the blackmode from the surface of the metal article, thereby refining the surface of the metal article, after which the blackmode is immediately re-formed by the reaction between the metal article and the chemical solution for further refining by the non-abrasive metal media.

46. (new) The method of claim 45, wherein the non-abrasive metal media is selected from the group consisting of stainless steel media, titanium alloys, nickel-chromium alloys and combinations thereof.

47. (new) The method of claim 45, wherein the vibratory finishing apparatus is operated at 800-1500 revolutions per minute at an amplitude of 1 to 8 millimeters.

48. (new) The method of claim 45, wherein the chemical solution is added to the vibratory finishing apparatus at a rate of 0.25-0.4 gallons per hour per cubic foot volume of the vibratory finishing apparatus.

49. (new) The method of claim 45, wherein the shape of the non-abrasive metal media is selected from the group consisting of pins, diagonals, ballcones, and mixtures thereof.

50. (new) The method of claim 45, wherein the chemical solution comprises a chemical selected from the group consisting of phosphoric acid, phosphates, sulfamic acid,

oxalic acid, oxalates, sulfuric acid, sulfates, chromic acid, chromates, bicarbonate, fatty acids, fatty acid salts, and combinations thereof.

51. (new) The method of claim 50, wherein the chemical solution further comprises an activator or accelerator selected from the group consisting of zinc, magnesium, iron phosphates and combinations thereof.

52. (new) The method of claim 50, wherein the chemical solution further comprises an oxidizer, selected from the group consisting of inorganic oxidizer, organic oxidizer, peroxides, meta-nitrobenzene, chlorate, chlorite, persulfates, nitrate, nitrite compounds, and combinations thereof.

53. (new) The method of claim 50, wherein the chemical is provided as a concentrate, and is diluted with water to prepare the chemical solution, wherein the chemical is diluted to between 5-80% by volume of the solution.

54. (new) The method of claim 45, wherein the metal article comprises steel.

55. (new) The method of claim 54, wherein the chemical solution comprises oxalic acid. *c613 M.*

56. (new) The method of claim 54, wherein the chemical solution is FERROMIL ® VII AERO-700 maintained at a concentration of about 75% by volume.

57. (new) The method of claim 54, wherein the chemical solution is introduced into the vibratory finishing apparatus at a rate of about 0.625 gallons per hour per cubic foot volume of the vibratory finishing apparatus.

58. (new) The method of claim 45, wherein the chemical solution is selected from the group consisting of FERROMIL® FML 575 IFP, FERROMIL® VII AERO-700, and REM® COPPERMIL 7.

59. (new) The method of claim 45, wherein after the surface of the metal article has been refined, a burnishing solution is introduced into the vibratory finishing apparatus.

60. (new) The method of claim 45 wherein the non-abrasive metal media that is not reactive with the chemical solution is combined with a non-abrasive plastic media.

61. (new) The method of claim 45, wherein the rate of blackmode formation and removal is balanced so that the blackmode is soft enough to allow the non-abrasive metal



Serial No.: 09/758,067
Confirmation No.: 7121
Applicant: Holland, et al.
Atty. Ref.: 12350.0008.NPUS00

media to remove the blackmode from the surface of the metal article and finish the metal article to an Ra of less than or equal to 2.5 microinches.

B1
av 62. (new) An article that is finished using the method of any of claims 22-61.